

REMARKS

Summary of the Office Action

Claims 23-26 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite;

Claims 2-7 and 9-26 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Fukuyo et al. (European Patent No. 1,338,371) (hereinafter “Fukuyo”) in view of Kurosawa et al. (U.S. Patent No. 5,463,202) (hereinafter “Kurosawa”); and

Claims 1-22 stand provisionally rejected over the non-statutory obviousness-type double patenting doctrine over co-pending applications with the Serial No. 10/585,343 and 10/585,660.

Summary of the Response to the Office Action

Claims 2-7 and 9-26 are pending, with Claims 1 and 8 cancelled by previous amendments. The present Amendment amends Claims 2-4, 9-11, 16, 20, and 23-26 to address issues of form without introducing any new matter.

In particular, Applicants have amended dependent Claims 23-26 to address the antecedent basis issues that lead to the rejection under 35 U.S.C. § 112, second paragraph, and to correct an informality. Moreover, Applicants have further amended Claims 2-4, 9-11, 16, 20, and 23-26 to correct minor formal issues, as a result of discussions during an interview with Examiner Wasaff on October 12, 2011. In addition, Applicants have traversed the rejections under 35 U.S.C. § 103(a). Furthermore, a Terminal Disclaimer is filed to address the obviousness-type double patenting rejections.

Examiner Interview

Applicants thank Examiner Wasaff, Art Unit 3742, for the courtesy of granting a telephonic interview to Applicants' representative Nikolaus P. Schibli, Ph.D., Reg. No. 56,994, on October 12, 2011 during which the pending issues of this case were discussed.

After Applicants' representative explained the invention as recited in the claims and discussed the differences between the claims and the cited prior art, Examiner Wasaff indicated that the expressions "height of a main surface of the object" and "adjusting a gap between the lens and the main surface" were unclear and needed clarification. Moreover, the Examiner indicated that the features related to the first and second time interval with relationship to the first and second speed, respectively, needed clarification. In response, Applicants' representative suggested claim amendments to address the rejections under 35 U.S.C. § 112, second paragraph, and to clarify the claims. Examiner Wasaff indicated that the discussed amendments may overcome the pending rejections under 35 U.S.C. §§ 103(a) and 112, second paragraph, but that he would have to consider them more carefully upon submission of a formal response.

Clarifying Amendments

Applicants have amended Claims 2-4, 9-11, 16, 20, and 23-26 to address the issues that were discussed during the interview. In particular, the claims are amended to replace the expression "gap" with "distance" and to clarify the directions of the movements and/or measurements. No new matter has been added. Moreover, the independent claims are also amended to recite that the modified region is formed "in a predetermined depth relative to the

main surface of the object.” This feature finds non-limiting support in Figures 8a-c and in the corresponding passages of the specification. No new matter has been added.

In light of these amendments, it is believed that the formal issues of the claims as pointed out during the interview are addressed. However, if the Examiner disagrees, Applicants respectfully request the Examiner to contact Applicants’ representative so that a mutually acceptable language for the claims can be developed.

Rejection under 35 U.S.C. § 112, Second Paragraph

Claims 23-26 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. In response, Applicants herewith amend dependent Claims 23-26 to delete the term “displacement” and to replace it with “height,” to address the issues of antecedent basis. In addition, these claims are amended to recite “cutting line” instead of “line to cut.”

Because these changes are only formal in nature, it is believed that no new matter has been added. Accordingly, Applicants respectfully submit that the issues under 35 U.S.C. § 112, second paragraph are herewith addressed, and traverse this rejection.

Rejection under 35 U.S.C. § 103(a)

Claims 2-7 and 9-26 are rejected under 35 U.S.C. § 103 (a) as being obvious over Fukuyo in view of Kurosawa. This rejection is respectfully traversed.

Briefly summarizing, Applicants’ independent Claim 2 is directed to a laser processing method for irradiating an object to be processed with a first laser beam while converging the first

laser beam with a lens such that a converging point is positioned within the object, and forming a modified region within the object along a cutting line.

The method includes a height acquiring step of irradiating the object with a second laser beam for measuring height of a main surface of the object in an optical axis direction of the lens while converging the second laser beam with the lens, and acquiring the height of the main surface along the cutting line by detecting reflected light reflected by the main surface in response to the irradiation of the object with the second laser beam; and a processing step of emitting the first laser beam and moving the lens and the object relative to each other in a perpendicular direction to the optical axis direction of the lens while adjusting a distance between the lens and the main surface according to the acquired height, so as to form the modified region along the cutting line in a predetermined depth relative to the main surface of the object.

In addition, the height acquiring step is performed at a first time interval while moving the lens and the object relative to each other at a first speed in the perpendicular direction to the optical axis direction of the lens; and the processing step is performed at a second time interval shorter than the first time interval while moving the lens and the object relative to each other at a second speed faster than the first speed in the perpendicular direction to the optical axis direction of the lens.

Turning now to the rejection references, Fukuyo is directed to a laser beam machining method that is capable of cutting a work without producing fusing, where the pulse laser beam L is radiated on the predetermined cutting line 5 on a surface 3 of the object 1 to cause multiple photon absorption. Abst., Figs. 14-15. Fukuyo explains that the light-converging point P of the

laser light L can be controlled to a specific position within the object 1, and it is possible to move the X-axis stage 109 and the Y-axis stage 111 for displacing mounting table 107 for laser processing. ¶¶ [0138]-[0142], Fig. 14.

The Office Action states that Fukuyo allegedly teaches some of the features of Applicants' independent Claim 2 related to the first and second speeds at his paragraph [0304]. However, in this paragraph, and with reference to his Figure 87, Fukuyo explains the operation of a speed calculation section that calculates the stage moving speed of stage 119, 111 by stage controller 115. ¶¶ [0138]-[0141], [0304], Figs. 14, 87. The calculation of the speed as described in paragraph [0304] is part of the eighth example, where the distance between adjacent modified spots that are formed by each pulsed laser beam is controlled. ¶ [0284]. Basically, Fukuyo explains that the speed calculation section 149 receives the distance or pitch p between two adjacent modified spots from a distance calculating section. ¶¶ [0298], [0304]. Based on this distance, the speed calculation section 149 determines a stage moving speed and sends this value to the stage controller 115. Id. This allows the overall controller 127 to control the distance between two adjacent modified spots during the laser processing and multiphoton absorption at a desired distance, by the use of a look-up table. ¶¶ [0300], [0304].

Fig.87

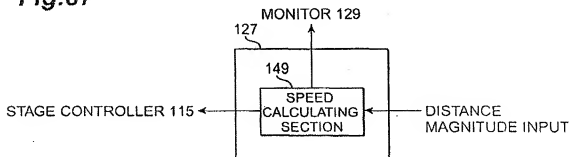


Figure 7 of Fukuyo

Moreover, with respect to paragraphs [0144]-[0145], Fukuyo explains that the laser processing apparatus 1000 can modify a movement of the Z-axis with Z-axis stage 113 so that the light-converting point P of the laser light is located on surface 3 so that an auto-focusing function can be performed so as to position point P of the laser light inside object 1. ¶¶ [0144]-[0150], Figs. 14-15, steps S109, S111. However, Fukuyo fails to teach all the features of Applicants' independent Claim 2. In particular, Fukuyo fails to teach the combination of Claim 2 comprising the following features:

a processing step of emitting the first laser beam and moving the lens and the object relative to each other in a perpendicular direction to the optical axis direction of the lens while adjusting a distance between the lens and the main surface according to the acquired height, so as to form the modified region along the cutting line in a predetermined depth relative to the main surface of the object
...

wherein the processing step is performed at a second time interval shorter than the first time interval while moving the lens and the object relative to each other at a second speed faster than the first speed in the perpendicular direction to the optical axis direction of the lens.

(Claim 2, portions omitted.). Fukuyo does not teach or render obvious such a feature in paragraph [0304], because this portion of the reference only explains the concept of controlling the pitch or distance between adjacent modified regions formed by two laser pulses by modifying the stage moving speed of the stage controller 115, and the positioning of the light-converging point P of the laser light L inside the object 1. Accordingly, Applicants respectfully traverse the conclusion of the April 20, 2011 Office Action with respect to Fukuyo. Office Action, from p. 3, l. 18, to p. 4, l. 4.

The reference Kurosawa, used by the April 20, 2011 Office Action to form the 35 U.S.C. § 103(a) rejection, fails to remedy the deficiencies of Fukuyo. The reference Kurosawa is directed to a method for detecting the machining status of a laser beam machining device that uses secondary light 9 that is generated by the machining operation and is returned from the surface 29 of the workpiece W into a resonator 12 for controlling the machining operation. Abst., Fig. 1, col. 4:24-55. In particular, Kurosawa explains that his system allows to detect the focal position of a laser by using secondary light 9 of the same laser. Col. 2:13-23. However, Kurosawa fails to teach the above quoted features of Applicants' independent Claim 2.

Accordingly, even if we assume *arguendo* that the above references Fukuyo and Kurosawa can be combined, the combination of these two references fails to teach or render obvious all the features of Applicants' independent Claim 2, and therefore this rejection is respectfully traversed.

With respect to the rejections of independent Claims 3 and 4, these claims are different in scope from independent Claim 2, but are also directed to laser processing methods. For example, Applicants' independent Claim 3 requires a step of "adjusting a distance between the lens and the main surface in the optical axis direction of the lens according to the acquired height, so as to form the modified region along the cutting line in a predetermined depth relative to the main surface of the object." Moreover, independent Claim 4 requires "emitting the first laser beam and moving the lens and the object relative to each other in a perpendicular direction to the optical axis direction of the lens while adjusting a distance between the lens and the main surface in the optical axis direction of the lens according to the acquired height." In contrast, the cited passages of Fukuyo and Kurosawa fail to teach or render obvious these features. As shown

above, neither the reference Fukuyo nor Kurosawa teach or render obvious the acquisition of height along the cutting line. Fukuyo explains that the distance Z is adjusted by the stage controller 115 so as to position the light-verging point P inside the object 1, and Kurosawa merely detects a focal point of a laser without measuring or detecting heights along cutting lines.

Accordingly, Applicants respectfully traverse the rejections under 35 U.S.C. § 103(a) of Claims 2-4 over the references Fukuyo and Kurosawa, even if we assume that these references can be properly combined.

With respect to the rejections of independent Claims 9, 10, and 11, these claims have been amended to recite features that are similar to the features as argued above regarding independent method Claims 2, 3, and 4, respectively, but are different in scope and are directed to laser processing apparatuses. Accordingly, for the discussions towards patentability as set forth above with respect to independent Claims 2, 3, and 4, Applicants believe that independent Claims 9, 10, and 11 also patentably define over the references of record.

Moreover, the pending Office Action stated that “[a]pplicant’s remaining claim limitations have not been given patentable weight, since they recite method steps rather than differentiating between structures.” Office Action, p. 6, ll. 20-21. However, the Office Action failed to support this conclusionary statement with any authority. Applicants respectfully traverse this statement, because the wherein-clauses of Claims 9, 10 and 11 set forth further features of the respective elements of these claims. For example, Applicants’ independent Claim 9 requires a “control means for controlling . . . the moving means and holding means,” and the wherein clause further requires that the control means “controls the moving means so as to move the object and the lens relative to each other.” Accordingly, these clauses recite functional

descriptions of the claim elements, and such functional descriptions need to be construed under the provisions of 35 U.S.C. § 112, sixth paragraph, and cannot be simply disregarded as being non-limiting “method steps” as purported by the pending Office Action. The USPTO needs to determine the scope of the claims based on the disclosure of the corresponding structure, material, or acts described in the specification and equivalents thereof. *See e.g. In re Donaldson Co.*, 16 F.3d 1189, 29 USPQ2d 1845 (Fed. Cir. 1994).

Accordingly, Applicants respectfully traverse the rejections under 35 U.S.C. § 103(a) of Claims 9-11 based on the references Fukuyo and Kurosawa, even if we assume that these references can be properly combined.

Rejections under the obviousness double patenting doctrine

Claims 1-22 stand provisionally rejected on the grounds of non-statutory obviousness-type double patenting as being unpatentable over claims 1-14 of co-pending Application No. 10/585,343 and claims 1-18 of co-pending Application No. 10/585,660. Accompanying this response is a properly executed Terminal Disclaimer. However, Applicants respectfully submit that the filing of terminal disclaimers to obviate a rejection based on double patenting is not an admission of the propriety of the rejection. *Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991). Withdrawal of the double patenting rejection is respectfully requested.


CONCLUSION

In view of the foregoing, Applicants submit that the pending claims are in condition for allowance, and respectfully request reconsideration and timely allowance of the pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response; the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution. A favorable action is awaited.

EXCEPT for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. § 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0573. This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3).

Dated: October 19, 2011

Respectfully submitted,

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